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ABSTRACT

This multiple-case study describes how three constructivist high school teachers attained their knowledge and skills and how the knowledge and skills translate into classroom applications in the high school setting. Ongoing interviews and observations were conducted over 1 year with selected participants, and documents provided by each constructivist teacher were reviewed. Data were analyzed and compared using constant comparative and content analysis procedures. Results indicated that constructivist teachers believed they were born with a propensity toward teaching. Crystallizing events formed the foundation of their personal learning theories, which they described clearly in metaphoric language. Their classroom practices evolved over time to become more congruent with their belief systems and reflected core constructivist tenets. Constructivist teachers fostered strong relationships with their students and taught beyond the prescribed curriculum to ensure meaningful student learning. These constructivist teachers enacted their practice with or without administrative support and desired professional development that addressed their needs and promoted an active environment. They were outliers among their high school colleagues, and they embraced teaching as a lifetime passion. (Contains 55 references.) (SM)

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Constructivist High School Teachers in a Metropolitan School District: Three Case Studies

A paper by

Denise Seguine

presented at

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Abstract

As a result of several societal and educational trends, many teachers have been compelled to transform their classroom instructional techniques to prepare students for an unknown future in American society. While the structure and curriculum of elementary schools lend themselves toward constructivist practices, high school teachers find themselves in a culture where teaching with constructivist methods is overwhelmingly difficult.

This multiple-case study tells the story of how 3 purposively selected high school constructivist teachers have attained their knowledge and skills and how these knowledge and skills translate into classroom applications in the high school setting. The researcher conducted year-long, ongoing interviews and observations with selected participants and reviewed documents provided by each constructivist teacher. Data were analyzed and compared using constant comparative and content analysis procedures.

Selected major findings and reflections verified that constructivist teachers believed they were born with the propensity toward teaching. Crystallizing events formed the foundation of their personal learning theories, which these constructivist teachers described clearly in metaphoric language. Their classroom practices evolved over time to become more congruent with their belief systems and reflected core constructivist tenets. Constructivist teachers fostered strong relationships with their students and taught beyond the prescribed curriculum to ensure meaningful student learning. These constructivist teachers enacted their

practice with or without administrative support and desired professional development that addressed their needs and promoted an active learning environment. They were outliers among their high school colleagues, and they embraced teaching as a lifetime passion.

The study provides implications for teachers, educational leaders, and teacher preparation programs. One implication of this study is that constructivist practice in American high schools is still the exception rather than the rule. Another implication highlights the tension between the current push for accountability and the constructivist practice that facilitates student learning. Other implications inform teacher preparation programs by providing examples of constructivist practice at the high school level.

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Constructivist High School Teachers in a Metropolitan School District:

Three Case Studies

Meaning is not something you stumble across,
like the answer to a riddle or the prize in a treasure hunt.
Meaning is something you build into your life.
You build it out of your own past,
out of your affections and loyalties,
out of the experience of mankind as it is passed on to you,
out of your own talent and understanding,
out of the things you believe in,
out of the things and people you love,
out of the values for which you are willing to sacrifice something.
The ingredients are there.
You are the only one who can put them together
into that unique pattern that will be your life.
Let it be a life that has dignity and meaning for you!
If it does, then the particular balance of success or failure is of less account.

(Gardner, 1996, p. 13)

Over the past 100 years, significant changes in thinking about education have led to the possibility of a new dynamic in America's schools. In the early part of the 20th century, the Industrial Age mentality of the assembly-line model promoted belief in more linear, cause-effect relationships that required quantifiable measurements for reliability. In addition, this same perspective led to the belief that when things are taken apart, and their smallest part is examined, the answer to how everything fits together can be discovered. This factory, assembly-line model for schools made sense in that historical context.

At the gateway of the 21st century, schools find themselves in a totally different world. Due to rapid technological advances, the knowledge explosion is continuing at a relentless pace (Gates, Myhrvold, & Rinearson, 1996; Gleick,

1999). Additionally, with emergence of the "new sciences," a different view of how the world works is revealed. Wheatley (1992) stated:

> In new science, the underlying currents are a movement toward holism, toward understanding the system and giving primary value to the relationships that exist among seemingly discrete parts. . . . When we view systems from this perspective, we enter an entirely new landscape of connections, of phenomena that cannot be reduced to simple cause and effect, and of the constant flux of dynamic processes. (p. 9)

Further, recent, dramatic developments in cognitive science are leading to a better understanding of how the brain functions (Sylwester, 1995). This increased understanding has led to widespread implications for the development of appropriate and effective educational applications of this knowledge.

Collectively, these societal advances have led to shifts in people's perceptions of the world and, subsequently, of the educational system. According to Tyack and Cuban (1995), "Typically when people have proclaimed public education a 'failure,' . . . the chief criticism was that the schools did not match the modern template of progress" (p. 12). Educators, therefore, must consider these societal advances as they seek to create schools of the future.

In response to new understandings from science and technology, many educators have embraced the concept of constructivism. Earlier work on thinking skills and findings from cognitive psychology provide a base for constructivism that:

> emphasizes the learner as a meaning maker—a constructor of meaning. It emphasizes depth, not coverage; poses a contextualized and complex problem for students; ensures that students have a sound knowledge base

for solving the problem; and sees the teacher's role as a problem structurer and a scaffolder. (Glatthorn & Jailall, 2000, p. 105)

Encompassing learner-centered constructivism requires most teachers to transform their classroom teaching methods.

Constructivist approaches to teaching children have been developed over the last 3 decades, particularly in early childhood education (De Vries & Kohlberg, 1987; Kamii, 1982; Katz, 1985), but, more recently, they have gained acceptance in high schools through math, science, and social studies education (Banks, 1995; Blais, 1988; Schifter, Russell, & Bastable, 1999; Yager, 1993). Brooks and Brooks (1993) emphasized constructivist educational settings as places where:

- students are allowed to focus on large ideas rather than "fact-driven curriculums,"
- students are given the "exhilarating power" to make their own connections and reach unique conclusions,
- teachers support the message that the "world is a complex place in which multiple perspectives exist," and
- teachers acknowledge that learning is a process that includes "messy endeavors that are not easily managed." (p. 22)

For the constructivist teacher, the student is an inquirer, actively investigating the world around him/her and building personal meaning through the mental activity prompted by these encounters.

The path toward constructivist classrooms is one in which teachers also will be involved in a journey of self-discovery and a new way of perceiving the

task of teaching. Crowell, Caine, and Caine (1998) stated, "We are convinced that most teachers want a coherent picture of the learning and teaching process, which they can use to create a stronger more substantive curriculum and to enliven the instructional processes they choose" (p. viii). This journey of discovery about how learning happens may lead to a transformation in teacher beliefs and actions.

Early in the 20th century, education's fundamental responsibility was to "prepare for the 50 years of adulthood, not for the 20 years of childhood and youth" (Bobbitt, 1924, p. 8). In opposition to Bobbitt's position, Gorman and Johnson (1991) argued that childhood and adolescence could no longer be viewed as a "segment of human life to be tolerated until it is outgrown. . . . Self-hope, self-esteem, and self-confidence are the building blocks of all learning. The child must learn to evaluate his or her own interest and potential" (p. x). Similarly, Dewey (1938) urged that education be viewed as a process of living and not a preparation for future living. Constructivist practices support the vision that students and teachers work together to create a shared understanding of today's world that will project into students' futures.

This research summary is written in 4 major sections. The first section describes the research design overview and methodology of the study. The second section encapsulates each case teacher while the following section provides a summary of cross-case analysis findings. The paper concludes with reflections on the cross-case analysis findings, implications of the research, and directions for further research.

Research Design Overview and Methodology

This sections describes the research design and methodology used for the study. Included are the purpose of the study, research questions, research design, selection of study sites and participants, data collection instruments, data analyses, and trustworthiness of data.

Purpose of the Study

This qualitative, multiple-case study sought to shed light on constructivist teaching practices at the high school level. The purpose of this study was to tell the story of how selected high school constructivist teachers have attained their knowledge and skills and how these knowledge and skills translate into classroom applications in the high school setting.

Research Questions

Because case study fieldwork often takes the research in unanticipated directions, too much definition of questions in advance is problematic (Merriam, 1998; Stake, 1995; Yin, 1984). By making a flexible list of questions and progressively redefining issues, the researcher seized opportunities to learn the unexpected and allowed teachers to tell and interpret their own stories. Lincoln and Guba (1985) spoke of design flexibility in this way: "Theory emerges from the inquiry for the naturalist; it is not given a priori. If the methodology must be resonant with the theory, methods can be clarified only as theory emerges, and the methods may very well change in the process of theory definition" (p. 224).

For the purpose of this study, the research questions developed were guiding questions at the beginning of the study. The guiding questions were:

- What common and disparate beliefs, values, and attitudes do constructivist teachers hold about students and learning that drive their decisions about instructional practices? Where did these beliefs, values, and attitudes originate?
- What can be seen in life experience and instructional approaches that define these teachers? How does an individual person become a constructivist teacher? Is the person born with a constructivist outlook, or do specific, identifiable incidences frame a developmental path toward constructivism? If so, what are these pivotal experiences?

Research Design

The structure of this case research design was qualitative in nature. Qualitative research methods allowed for the researcher to collect rich data that demonstrated an interrelationship of the constructivist case teachers with their context. The research design substantiated the perceptions and larger issues identified by key informants through the process of data collection and analysis.

The researcher used a multiple-case study design to answer the research questions. The case study is an established research design that has been used in the development of many professions to understand unique or significant cases (Merriam, 1988). Patton (1990) stated that case studies "illustrate the value of detailed, descriptive data in deepening our understanding of individual variation" (p. 17). Because the essence of case study is about particularization, not generalization (Stake, 1995), this research design was appropriate for the emphasis on uniqueness in each case. In addition, Yin (1989) proposed that the case study is a design particularly suited to situations, such as the one in this

study, where it is difficult or impossible to separate the variables in a case from their context.

This study employed a multiple-case study design, as opposed to a single-case study design, to gain a broader understanding of the nature of high school teachers' choices toward constructivist classroom practices and the forces that shape those choices. Yin (1989) wrote, "The evidence from multiple cases is often considered more compelling, and the overall study is therefore regarded as being more robust" (p. 52).

To build case studies, the researcher incorporated a two-phase process. The first phase focused on participant selection by identifying constructivist teachers. During the second phase, the researcher used qualitative methods to collect data and to formulate broad descriptions of teachers' beliefs and behaviors in their classrooms. This second phase assisted the researcher in providing a more in-depth, rich description of constructivist teachers. It further informed the researcher about the developmental path that led these teachers to constructivist practices.

Selection of Study Sites and Participants

Three high schools in a midwestern metropolitan school district were selected as research sites. The geographical location allowed the researcher access to each site and enabled the researcher to spend time gathering data from individual participants in each of the schools.

The researcher used metropolitan high schools with different organizational structures and student enrollments to accommodate transference of study findings to a variety of settings and thereby make the study more useful. A cross-case analysis of the data allowed rival explanations to be considered in

the explanation-building process (Yin, 1998). The researcher included 1 alternative high school, 1 large comprehensive high school that incorporates block scheduling, and 1 large comprehensive high school that uses traditional scheduling. Patton (1990) stated that selecting a small sample of great diversity will yield two types of findings: "1) high-quality, detailed descriptions of each case, which are useful for documenting uniqueness, and 2) important shared patterns that cut across cases and derive their significance from having emerged out of heterogeneity" (p. 172).

Site and individual respondent selection process began with the researcher contacting building principals and gaining consent to interview them and conduct research in their schools. Given a set of criteria for a constructivist teacher, each of the 3 high school principals nominated constructivist core-subject area (language arts, math, science, or social studies) teachers. Altogether, 13 teachers were nominated by their principals as practicing constructivism.

In addition, the researcher obtained consent to collect data through observations and interviews with participating teachers. One classroom observation and a personal interview were conducted with each teacher to confirm his or her use of constructivist practice.

The final method used to confirm the selection of constructivist teachers was the use of peer survey data. Nominated teachers were asked to provide names of 6 peer teachers who had knowledge of the nominated teacher's classroom practices and instructional beliefs. The researcher administered a peer survey to identified peer teachers to obtain further data to confirm nominated teachers' constructivist practices. From the peer survey data, the researcher developed a process and form to compare and contrast data to determine which 3

nominated teachers best matched the researcher's constructivist criteria for the purpose of this study.

The final selection of cases gave the researcher teachers in three core-subject areas: math, science, and social studies. In one high school, the only nominated teacher who met the study's criteria and consented to participate in the study was a math teacher with NBPTS certification. Therefore, the researcher chose this teacher as a case and did not consider nominated math teachers from other schools as potential cases. In another school, one of the nominated teachers who met study criteria was a science teacher who was new to teaching but had earned an alternative certification after 18 years of working as a medical technologist. The researcher chose this teacher and did not interview or observe other nominated teachers in that school. In the third selected school, the researcher interviewed and observed an English teacher and a social studies teacher. Both teachers met the criteria for the study and both taught in core-subject areas not already represented in the study. For two reasons, the researcher chose the social studies teacher: he was the only male teacher in the nomination pool, and the English teacher was considering a career move. These three teachers became the cases that participated in phase two of the study.

Data Collection Instruments and Strategies

In qualitative inquiry, the researcher is viewed as the data collection instrument (Meloy, 1994; Merriam, 1998; Patton, 1990). Because the researcher is the primary instrument of data collection and analysis, "interpretations of reality are accessed directly through their observations and interviews. . . . Most agree that when reality is viewed in this manner, internal validity is a definite strength of qualitative research" (Merriam, p. 203). Throughout this study, the

researcher was cognizant of her role as the data collection instrument, and, as such, kept fieldnotes, both descriptive and reflexive, of each encounter in the field.

This researcher used several qualitative data collection strategies during the study. Survey, in the first phase of the study, was used only to select participants for the study. Each of these strategies, and the rationale for its use, is described in this section.

Surveys. Peer surveys were used as one indicator in the selection of cases during phase one. Survey items were designed to match the criteria for constructivist teachers provided for principals during the nomination process. The survey included a continuum response scale where descriptors of constructivist practice and descriptors of traditional practice were at opposite ends of the continuum for each criterion. Each "box" on the continuum was assigned a specific value ranging from "5" to "1". Those rated at "5" represented characteristics most like constructivist practice, and those rated "1" represented characteristics least like the constructivist practice. Total response raw scores were calculated for teachers who had an equal number of peer respondents.

Interviews. Interviews were used during two phases of this study. In the first phase of respondent selection, principals participated in interviews with the researcher. In the second phase of the study, case teachers participated in extensive individual interviews. Patton (1990) stated, "the purpose of interviewing is to allow [the researcher] to enter into the other person's perspective" (p. 278). Interviews were one way of collecting divergent views of constructivist teaching methods.

Once constructivist teachers were nominated during phase one of the study, the researcher used the standardized interview format to gather data from these teachers. A set of protocol questions provided structure to guide these phase one interviews. This standardized form allowed the researcher to compare information from various sources. The use of this technique minimized the effect an individual researcher may have had on the interview and helped to simplify the process of data analysis (Patton, 1990). The interview questions sought information regarding constructivist practices incorporated by each nominated teacher.

In the second phase of this study, the researcher used a general interview guide approach for interviews with each teacher (Patton, 1990). The interview guide approach did not require a list of predetermined, standardized questions to be asked during each interview, but rather made use of a list of general topics and questions to be covered during the session. Informal conversational interviews that occurred after on-site observations were also conducted. Using these open-ended approaches provided an opportunity for respondents to feel more comfortable in sharing their life histories from a personal perspective. While the issues of truth and bias in life histories posed some limitations, Marshall and Rossman (1989) proposed that this type of account added much flavor to the qualitative study.

Finally, the researcher employed a group interview to allow case study participants to collectively interact. While Merriam (1998) suggested that the multisite design in itself enhances the possibility of generalization of results, interaction of the individual case participants may draw on that tacit knowledge, intuition, and personal experience that people use to create patterns that explain

their own experience. In the end, however, "reader or user generalizability involves leaving the extent to which a study's findings apply to other situations up to the people in those situations" (Merriam, p. 211).

On-site observation. Another inquiry method implemented for this study was on-site observation. On-site observation is a data collection technique commonly used by qualitative researchers to purposefully watch, listen, and learn about an object of study in its own environment (Babbie, 1998; Kumar, 1996). In the development of each case study, the researcher's firsthand data gathering at each site was valuable in formulating an in-depth understanding of the case. Babbie (1998) suggested that, "although some things can be studied adequately in questionnaires or in the laboratory, others cannot. And, direct observation in the field lets you observe subtle communications and other events that might not be anticipated or measured otherwise" (p. 285).

During the first phase of this study, on-site observations were used to confirm constructivist behaviors of teachers nominated by school principals. On-site observations conducted during the second phase of this study to allowed the researcher to personally observe the behaviors of the identified teachers. Events and behaviors observed during these visits were recorded in fieldnotes using a face sheet. In addition, observations were tape-recorded and analyzed for their role in supporting or challenging a constructivist instructional approach. Photographs and video-taping were also used to capture artifacts in the field that eluded immediate description.

For each participant in the second phase of the study, the researcher observed teacher behaviors and activities in individual classrooms. Multiple weekly observations over the course of 2 school semesters provided the

researcher with another source of rich, thick data for formulating each case study and telling the personal stories of case teachers.

Document review. Document review was the third strategy for inquiry in the second phase of this study. Documents from constructivist teachers provided corroborating evidence of their constructivist classroom practices. Erlandson et al. (1993) reported, "Because all data must be interpreted in terms of their context, it is extremely important that materials be collected to give holistic views of the context" (p. 31).

The documents reviewed by the researcher included:

- examples of teacher lesson plans and assignments;
- examples of teacher tests and performance assessments;
- examples of student artifacts;
- school websites;
- workshop or conference descriptions of training received by study participants; and
- teacher portfolios.

These data were analyzed to establish the study's context and add to deeper understanding of the teacher's beliefs, attitudes, and values. Kerlinger (1973) stated the purpose of such research is to discover major relationships and patterns where little is known and to provide the basis for more precise definition of variables and collection of categorized data. Marshall and Rossman (1995) explained, "Qualitative data analysis is a search for general statements about relationships among categories of data; it builds grounded theory" (p. 112).

Documents assisted the researcher in creating a holistic picture of the study's interrelated context.

Data analyses. The data derived from this study were analyzed on two levels. First, each case was analyzed as a single entity, and then a cross-case analysis was completed comparing the three cases. Data collected from each of the qualitative inquiry processes described (i.e., interviews, on-site observations, and document review) were electronically recorded. Data to be compared and contrasted were entered into the interactive, database software FileMaker Pro®.

Data from interviews were analyzed using the constant comparative method of unitizing and categorizing data (Lincoln & Guba, 1985). This method required that data be broken down into their smallest units of meaning. Stake (1995) informed, "the qualitative researcher concentrates on the instance, trying to pull it apart and put it back together again more meaningfully—analysis and synthesis in direct interpretation" (p. 75). The data were unitized and categorized to form themes.

This thematic data allowed the researcher to analyze and triangulate data obtained from multiple sources. Patton (1990) stated that, "A multimethod, triangulation approach to fieldwork increases both the validity and reliability of evaluation data" (p. 245). Triangulation of various data collection techniques permitted the evaluator to combine the strengths and correct the weaknesses of any one source of data. In using triangulation as a method of data analysis, "the researcher seeks out several different types of sources than can provide insights about the same events or relationships" (Patton, p. 115).

Data from on-site observations and document review were compiled and summarized to describe constructivist teachers and to identify key components of

their instructional practices. A content analysis was used to analyze found data. Patton (1990) identified the purpose for classification of qualitative data for content analysis as to "facilitating the search for patterns and themes within a particular setting or across cases" (p. 384). Some researchers considered the unobtrusiveness of content analysis as one strength of the method for document review (Babbie, 1998; Marshall & Rossman, 1989).

Trustworthiness of data. Lincoln and Guba (1985) identified naturalistic techniques that promote trustworthiness. To increase the probability that credible findings were produced in this study, the researcher incorporated several of Lincoln and Guba's suggestions such as extended engagement, persistent observation, and triangulation of data. To further ensure credibility of the data, the researcher employed peer debriefing. Erlandson et al. (1993) declared the value in this technique in "helping the inquirer deal with a process that is a lonely one" (p. 140).

Another method the researcher used to ensure trustworthiness of data was member checks with each interviewee (Lincoln & Guba, 1985; Marshall & Rossman, 1995). Each case teacher was given a copy of transcripts from interviews and a draft copy of their case for review and correction. The researcher made alterations to each chapter based on feedback from this case review. Erlandson et al. (1993) maintained support for consistent use of member checks:

> Because the realities will be included are those that have individually and collectively been constructed by persons within the context of this study, it is imperative that both data and interpretations obtained be verified by

those persons. No data obtained through this study should be included in it if they cannot be verified through member checks. (p. 31)

Along with the triangulation technique, the researcher maintained a reflexive journal to establish a confirmability audit (Lincoln & Guba, 1985). Merriam (1998) referred to this type of researcher's journal as "an introspective record [that] . . . includes his or her ideas, fears, mistakes, confusion, and reactions to the experience and can include thoughts about the research methodology itself" (p. 110). In addition to introspective reflections by the researcher, this journal included a daily schedule, logistics of the study, and a methodological log where methodology decisions and their rationales were recorded.

Although verification of the data source was imperative, confidentiality of all data related to the research study was maintained. To this end, all subjects were given pseudonyms to maintain their confidentiality. In addition, each school site was also given an alternate name.

Cases in this study signed consent to participate in a group interview with each other, thus agreeing to forego confidentiality. As the study emerged, however, the researcher decided that school and classroom pictures would inform the reader in a way the written word would not. In addition, the researcher asked each case teacher to provide a brief video clip describing his or her philosophy of learning. This video clip, although not used in the written document, was to be used for defense of the study. Case teachers were asked to sign a second consent that provided for these emerging needs in the study.

Review of Case Teachers

Three constructivist high school teachers were studied as the basis for this research. Mrs. Samikay Beech was a 26-year veteran of the teaching force who

had attained NBPTS certification. She taught math at Tyler High School, a traditional high school following a block schedule. Mr. Terry Allen had been teaching social studies for 15 years. His current practice was at Rochapella High School, the district's only magnet high school, which follows a 4 by 4 block schedule. Mrs. Elle Ment began teaching 4 years ago after leaving her 18-year career in medical technology. She taught science at Midland Compound High School, which follows a traditional 7-period daily schedule. This study painted a broad picture of each teacher's journey toward constructivism.

Mrs. Samikay Beech, High School Constructivist Math Teacher

Mrs. Beech viewed learning as a life-long pursuit that each person builds for himself or herself based on experience. She was a reflective teacher who had the ability to articulate her beliefs in words and in action as evidenced in her classroom practice. She believed that learning required a connection between new knowledge and prior knowledge and that learning was enhanced through group work and active engagement. In her efforts to meet the needs of every student, she first sought to build relationships with them.

Childhood experiences helped to build Mrs. Beech's teacher character. From her family support to work on the farm, she learned valuable lessons that she carried into her classroom practice. Her religious upbringing supported her vision of the ultimate mentor, Jesus Christ, whom she sought to emulate.

Educational and professional development experiences created the path for Mrs. Beech to become a constructivist teacher. Professional development in the form of workshop attendance, supervision of student teachers, and participation in study groups enhanced Mrs. Beech's teaching practice. She also credited consistent support and guidance from her mentors and administrators along her

developmental path. Mrs. Beech has provided leadership as a department chairperson, a building and district committee member, and a teacher of pre-service teachers. All of these experiences, in Mrs. Beech's eyes, contributed to her professional development.

Mrs. Beech believed that teachers were generally born and made, but to her, being a teacher required continually adding to her repertoire of experiences. She likened the learning process to getting on the highway where students may change lanes or slow down to avoid a roadblock, but they would never permanently exit. For her, the learning process was a life-long pursuit. In spite of the 26-year tenure of her teaching career, Mrs. Beech continued to have goals to make her teaching even more effective.

If Mrs. Beech was asked the purpose of learning, she would say it was "to experience life more fully." To her, education was so much more than the transmission of facts from teacher to student. It was the creation of a new understanding of the world in which students can develop to reach their potentials. Mrs. Beech's poignant words describe her belief in education: "How sad it would be if we are keeping kids from enjoying life by not giving them the education they need or not encouraging them to learn more; so they can experience more; so they can enjoy more."

Teaching for Mrs. Beech had been an evolving experience. She said, "I have a lot more fun teaching than I used to have." Her passion for learning was evident in her conversation and her classroom practice. She emphatically stated, "There's just no reason for this job to be anything but exciting every day!"

Mr. Terry Allen, High School Constructivist Social Studies Teacher

Mr. Allen was a deeply reflective, analytic thinker whose personal theories of educational practice were enacted daily in his social studies classroom. Students in Mr. Allen's classes experienced contextualized learning through simulation and role playing. He incorporated an integration of curricula in such a way that emphasized depth of student learning. Mr. Allen consistently mediated the classroom environment for his students through his unique use of learning and teaching tools. He was a master storyteller who wove history into the reality of individual student lives.

Educational experiences for Mr. Allen helped to shape his beliefs and values about teaching and learning. He learned about the value of caring for his students from one teacher, and he learned how he didn't want to be from another teacher. Mr. Allen's discovery of his own learning style marked a transformation in his life that helped to shape his professional teaching practice.

Along his path of educational and professional development, Mr. Allen credited a few influential people who helped him think about how to teach. Creating a new course was what Mr. Allen described as his most valuable professional development. Mr. Allen had little overt administrative support for his practice. For him, the best support an administrator could give was to allow him time to create and stay out of his way.

Because he was a deeply reflective thinker, Mr. Allen was clear about his professional self-definition. He defined the role of a teacher as a lover of his or her content, a relationship-builder with students, a facilitator of students' learning needs, and an instructional artist who takes advantage of opportunities to teach for student learning. Mr. Allen believed that teachers were born, and

they developed their craft as they experimented with their students. His goals reflected his belief that learning is a life long process, and he sought to create a thirst for learning in his students.

Mrs. Elle Ment, High School Constructivist Science Teacher

Mrs. Ment was a highly relational teacher who established her teaching practice after abandoning her first career in medical technology. After only 3 years of teaching at Midland Compound High School, her principal identified her as a constructivist teacher.

This teacher's classroom practice reflected several constructivist tenets. Mrs. Ment consistently u[illegible] authentic problems to facilitate her students' deeper understanding of the science concepts she was teaching. She further sought to enhance student learning by mediating the classroom environment with questioning techniques, teaching students specific study skills, and requiring students to reflect upon their work through problem solving and questioning. Finally, Mrs. Ment employed group work by including games, projects, and labs as part of her regular teaching repertoire.

Mrs. Ment grew up in a family that valued education. As the second of four children, she described herself as a hard worker with a lot of common sense. She identified her oldest brother as a genius and her other two siblings as bright. Two of the three siblings completed college degrees.

Growing up, Mrs. Ment learned the value of responsibility through her required duties in the home. These duties included cooking, cleaning, and baby sitting for her younger sister. Mrs. Ment described herself as a child with low self-esteem during her childhood years due to her constant struggle for recognition and acceptance by her parents.

Mrs. Ment found teaching as her second career. She spent 18 years in the medical field as a medical technologist before she earned an alternative certification to teach high school science. Going back to school was a great source of professional development for Mrs. Ment, but she was also a self-motivated, inquiring person who sought methods for improving herself. As a teacher, she had profound support from her administrator, and had, herself, embraced leadership roles in her school district.

Teaching high school was Mrs. Ment's dream job. She believed the role of a teacher was to be a "catalyst" for students' thinking and a relationship-builder for enhancing self-esteem. Although she believed that constructivist teachers are born with a predisposition to facilitate students' building of their own learning, she also felt that her experience in the classroom enhanced her abilities to act upon her constructivist beliefs. Mrs. Ment's highest goal was to continue to do what she currently does, "play with kids' minds."

Summary of Cross-case Analysis Findings

In the previous section, a description of the major attributes of each teacher was discussed. Mrs. Beech was a math teacher in her 26th year at Tyler High School. Mr. Allen, a 15-year teaching veteran, taught social studies at Rochapella High School. Mrs. Ment, a 4th year educator, entered teaching as a second career, and she became a member of the science department at Midland Compound High School. This section provides a summary of the cross-case analysis findings.

Each of these 3 constructivist high school teachers had their own theory of learning. Mrs. Beech used the metaphor of a coat rack to describe her learning theory. She believed that students have to have hooks, much like a coat rack, to

attach new learning. Mr. Allen described his theory as concentration. In order to acquire a body of knowledge and make learning real, Mr. Allen thought a student must apply concentration through a number of techniques to get knowledge into long-term memory. Mrs. Ment used an analogy from computer technology in her theory. She encouraged students not to "download" information and forget it. Instead, she told them they need to store it somewhere on the hard drive or on a floppy disk where they can access it in the future. Although the terminology in their various theories was different, core beliefs that supported the theories of these 3 constructivist teachers were very similar.

Mrs. Beech, Mr. Allen, and Mrs. Ment all described the origin of their belief systems by citing crystallizing events in their lives. Mrs. Beech and Mrs. Ment examined events from their childhood that helped to mold their beliefs about learning. Mr. Allen, however, thought his first critical incident occurred when he was in college and was the result of mistakes he had made.

Classroom teaching strategies varied among the 3 case teachers. All of them believed in the importance of active student engagement, the accessing of prior knowledge, and the act of making a mistake as an initiator for learning. A key factor for each of the 3 constructivist teachers was the relationships they fostered with each of their students. This personal relationship demonstrated the teachers' strong sense of caring and nurturing throughout their students' learning processes. The teaching strategies they incorporated in their classrooms were different based on individual student needs and the subject area. Mrs. Beech and Mrs. Ment used questioning techniques as a consistent strategy in their math and science classrooms. Mr. Allen incorporated storytelling to actively engage students in the history he sought to teach them.

The classroom curriculum taught by these teachers was aligned with district standards. Nevertheless, the standards were not the only thing these teachers reported teaching. Each of them felt that they also had a responsibility to teach students learning skills and life skills.

The approach to assessment seemed to be a developmental process for these constructivist teachers. Mrs. Beech, the math teacher with the most experience, used constructivist beliefs more fully in her assessments. She seemed to have an understanding that the assessment was part of the teaching process. Mrs. Ment, the least experienced science teacher, used primarily traditional testing, and she did not seem to make a connection between the way she taught and the way she assessed. Mr. Allen, whose years of experience fall between the other two, used some constructivist tenets in his classroom assessments, particularly as he did informal, formative assessments with his students.

Although the literature identified high schools as institutions that were primarily antagonistic to constructivist practices, these 3 teachers seemed to be unaware of this. In spite of the defined barriers, these teachers continued to act in a way consistent with their beliefs, even if they had to work around the system.

These constructivist teachers experienced varying levels of administrative support. Although they believed that administrative support was helpful for them, the lack of it did not interfere with the choices they made in their classrooms. Again, these teachers were true to their beliefs about how students learn, and they acted congruently with these beliefs.

Even though high schools teachers have limited access to one another's classrooms, these 3 constructivist teachers believed that they were somehow

different from their colleagues. They were unsure how to explain this difference, but their students were able to describe a clear dichotomy between the constructivist teachers' practices and that of their more traditional colleagues.

The 3 constructivist teachers in this study had varied personal and educational backgrounds. Yet, whether they were supported during their childhood or not, they became what they dreamed to be: teachers. When these teachers were asked if teachers are born or made, a definitive answer did not emerge. They did agree that the foundation for being a teacher was probably always there. Crystallizing events in each of their lives formed the foundation of constructivist teachers' beliefs, but their skills were developed through classroom practice.

Professional development was viewed differently by each of the 3 case teachers. All of them agreed, however, that staff development was most effective when it addressed the specific needs of the teacher and the experiences, themselves, promoted an active learning environment.

Each teacher had goals and aspirations for the future. Similarly, none of these teachers had a desire to leave the classroom. They all wanted to improve their classroom practice because that was where they wanted to be. Mrs. Beech expressed a strong desire to perpetuate the teaching profession. Mr. Allen wanted to extend his expertise through the creation of a video on student study skills for parents. Mrs. Ment wanted to finish her degree and continue to develop into a more effective teacher.

Reflections, Implications, and Future Study

This section includes reflections, implications, and potential areas for future study. The section is organized into three parts. The first part illustrates

These high school constructivist teachers and their students believe they are different from their more traditional peers. Although the teachers have an indistinct sense that they are different from their colleagues, they struggle to verbalize ways they differ from other teachers. Students, however, clearly see the differences among the constructivist teachers and other teachers. Students view their constructivist teachers as caring people who consistently strive to meet students' learning and personal needs. In addition, students have confidence in their teachers' strong command of their content areas.

Constructivist teachers believe they were born with a propensity toward teaching. Although they describe crystallizing events that formed the foundation of their teaching, they report their skill development as incremental and a result of classroom instructional experiences. These 3 teachers want active professional development that addresses their specific needs. Two out of 3 constructivist teachers did not think a majority of their building-level inservice was helpful in promoting effective teaching.

Constructivist case teachers see teaching as a lifetime passion that they embrace and have no desire to leave the classroom or the profession. They love working with high school-age students. Their goals are directly related to continual improvement of their classroom practice.

Implications of the Research Study

A review of literature framing a theoretical context for constructivism in American high schools, along with the findings and reflections on cross-case analysis, provide the basis for discussion of the study's implications. This research study contributed to the growing knowledge base of what is required for educators to understand constructivism and constructivist practices in the high

reflections on cross-case analysis findings. Implications of this research study are reviewed in the second section. The chapter concludes with a discussion of directions for future research.

Reflections on Cross-case Analysis Findings

The cross-case analysis allowed major themes to emerge about the beliefs and practices of the 3 constructivist teachers who participated in this study. A reflection on these findings unveils patterns that are similar, albeit different, in personal respects.

These constructivist teachers have personal theories of learning that support similar, basic, core beliefs. They use different metaphors to describe their theories, and these theories inform and drive their practice. They each describe crystallizing life events that formulated their belief systems. The life events occurred at different times during their life spans.

Strong relationships with their students characterize the teaching practice of these constructivist teachers. These teacher-student relationships provide constructivist teachers with key information about how individual students learn. Actively engaging students in instruction, accessing prior knowledge, and using student mistakes as initiators of learning are basic components of effective learning, according to the constructivist teachers in this study. They further employ a variety of teaching strategies to ensure a match between individual student needs and the curriculum being taught.

These teachers do not limit their teaching to the prescribed curriculum. Rather, they support the required standards, and, at the same time, incorporate study skills and life skills into their instruction.

school setting. These implications inform teachers, administrators, and teacher preparation programs.

One implication identified in this study is the importance of personal relationships in the learning process. This idea of student relationships is supported in the literature as an important component of higher student achievement (Brooks & Brooks, 1999; Caine & Caine, 2000; Darling-Hammond, 2000; Jensen, 1998; Kotulak, 1996). Although the study did not provide evidence that these constructivist teachers' students actually performed better than students taught by non-constructivist teachers, it revealed students whose sense of self-esteem and joy in learning was enhanced by their relationships with these teachers. Constructivist teachers used information from personal relationships with students to mediate the classroom environment in a way that facilitated learning and reflection for their students. At times, this mediation extended beyond the required curriculum standards to learning and life skills.

Another implication of this study is that constructivist practice in American high schools is still the exception rather than the rule (Boyer, 1983; Goodlad, 1984; Powell et al., 1985; Sizer, 1984, 1992, 1996; Sizer & Sizer, 1999; Talbert & McLaughlin, 1993). The constructivist teachers in this study were clearly instructional outliers compared with their teacher colleagues. They perceived their teaching as more active, humorous, and flexible than many other teachers in their schools. These data were confirmed by students' written comments that provide even stronger support for the teacher's more innovative teaching methods and sincere caring about each students' learning.

A third implication of this study is the tension between the current push for accountability and the constructivist practice that facilitates student learning.

In spite of recent demands for high standards and high-stakes testing, the teachers in this study believed that grades "paralyzed" learning. They used assessment techniques well grounded in constructivist theory. All 3 teachers identified students' prior knowledge and built on this knowledge base through active engagement and careful observation of student performances in the classroom (Brooks & Brooks, 1993; Gagnon & Collay, 2001; Glatthorn & Jailall, 2000; Marlowe & Page, 1998). Although these constructivist teachers were not completely free from traditional assessment practices such as multiple-choice tests, overall, they saw learning as individual and assessment as performance. The findings of this study lead to questions about the popular high-stakes assessments: Are national and state policy makers heading in the right direction when they promote standardized, high-stakes assessments? Do these high-stakes assessments measure meaningful learning, or do they encourage students to learn information that improves their test-taking skills?

The constructivist teachers in this study ignore, circumvent, or are oblivious to barriers found in the structure and culture of their high schools. These barriers often inhibit meaningful student learning. Constructivist teachers in this study believed that all students can and will learn. Their focus was student learning, not just completing a rite of passage or receiving a grade (Goodlad, 1984; Lawrence-Lightfoot, 1983; Sizer, 1984, 1992). They viewed learning as a condition of individual student experience rather than a sign of intelligence, and they provided multiple opportunities for students to construct their own meaning. What school counselors called the "low math class," the constructivist teacher renamed her "least experienced" students. For these teachers, not learning was not an option.

The ability of these constructivist teachers to engage all students raises questions about our educational system. Are educators at fault when students are not successful? When educators use labels (i.e., learning disabled, slow learners, low class) that inherently promote the perception that some students cannot learn, are they sealing students' fate in the system? To what extent does the jargon referring to student attributes define expectations and act as a determinant in student school success? Does the use of Carnegie units that equates "seat time" with learning violate individual student learning needs?

Another implication is the need for high quality, continuous professional development. Constructivist teachers described a need for personal learning opportunities that are relevant to them. The path toward constructivist classrooms is one in which teachers will be involved in a journey of self-discovery and a new way of perceiving the task of teaching that facilitates deep, meaningful learning (Costa, 2000; Larochelle & Bednarz, 1998; Senge et al., 2000; Zorfass, 1999).

Findings from this study do not contradict the literature on American high schools (Boyer,1988; Goodlad, 1984; Lawrence-Lightfoot, 1983; Powell, 1985; Sizer, 1984, 1992, 1996; Sizer & Sizer, 1999), but they highlight the ability of constructivist teachers to be instructional leaders. This study raises questions about who is most successful as the instructional leader: Should the role of the administrator be that of manager and instructional leader, or should administrators act as facilitators of learning when working with capable teacher leaders? None of these teachers saw the administration as a significant factor in the enactment of his or her practice. Based on the stories of the identified teachers, administrators may learn how to provide leadership and to create an

environment where constructivist teachers can act congruently with their beliefs for the benefit of educating all children.

Individual actions of the constructivist teachers in this study provide validation for the literature that reported teachers as the venue for making the transformation to constructivism a reality (Lawrence-Lightfoot, 1983; Stoddard, 1992). In light of this, implications for teacher preparation programs are evident. As teacher preparation programs seek higher standards and quality graduates, they need to consider that no one model or set of requirements meets the needs of potential teachers. The 3 teachers' backgrounds are disparate and their academic records are different. One followed the traditional path and would be seen as a successful college of education graduate. Another, however, may not have been admitted into teacher education with his initial grade point average. The third followed a circuitous path from a career in medical technology to enrollment in an alternative certification program.

The study further informs those involved with teacher education who want to provide examples of constructivist practice at the high school level. The methods used in this study to identify constructivist teachers could be adapted to select exemplary supervising teachers. Teachers in this study provided examples in content areas of math, social studies, and science.

Directions for Further Research

This multiple-case study tells the stories of how 3 purposively selected high school constructivist teachers have attained their knowledge and skills and how these knowledge and skills translated into classroom applications in the high school setting. Through the data obtained from qualitative data collection techniques, the study identified key implications for high school teachers,

educational leaders, and institutions of higher education. The literature review provided an important synthesis of information available to help educators understand the evolution of constructivist theory and the implementation of its educational practices in American high schools. The emerging themes derived from the analyses of the study's data answered the guiding research questions. Due to technological advances, the emergence of "new sciences" that dictate a different view of how the world works, and dramatic developments in cognitive science, educators are at the threshold of an evolving vision for American schools of the 21st century. This evolution will promote several areas for future research.

This qualitative, ethnographic research study was delimited in scope, and the results, although descriptive and possibly transferable, are not generalizable to other teachers. Further insight, therefore, may be gleaned from similar studies of constructivist teachers in different contexts. Beliefs and practices of constructivist teachers in different geographical areas of the country or in rural settings may be explored.

This study found that students entered into relationships with their teachers that made learning fun. The purpose of this study, however, did not extend to the effect of constructivist teaching on student achievement. Additional research is required to identify short- and long-term effects of constructivism on students. The influence of constructivist teaching practices on student achievement must be investigated through well-designed studies that ensure accurate measurement of student learning.

Another prime area for study is how the culture of the American high school promotes or impedes constructivist teaching practices. While the literature cited a number of barriers, the 3 constructivist teachers in this study were

unaware those barriers existed. Further research may help answer the questions: Does this finding imply that a change is occurring in the culture of American high schools, or is the context of the studied teachers unique? Do all constructivist teachers' beliefs and practices allow them to overcome barriers created by the system?

Potential for further study exists in examining the extent to which high school teachers embrace constructivist practices. By studying the beliefs and practices of all teachers in a given high school, the researcher may provide an accurate description of the differences between constructivist and non-constructivist teaching. The study may answer questions such as (a) do certain content areas lend themselves more toward constructivist practice than others do? (b) which teachers do students most request? and (c) from which teachers do students learn best? A study of this type would also inform educational leaders of criteria to consider when selecting their staff.

Further study is required to answer the question, "Are teachers born or made?" Constructivist teachers in this study reported their development in three stages: a crystallizing event, the development of individual learning theory, and classroom practice. The question of the origin of constructivist teachers' belief systems, however, remains unclear.

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